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Dwindling U.S. internal migration: Evidence of spatial equilibrium or structural shifts in local labor markets?[☆]

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ABSTRACT

This paper examines whether the significant downward shift in U.S. gross migration rates after 2000 is indicative of the economy nearing a stationary spatial equilibrium characterized by relatively small population growth differentials. Nearing spatial equilibrium would imply that site-specific factors such as amenities and location within the urban hierarchy substantially subside in their influence on net-migration and relative population growth because their values have been capitalized into prices, causing interregional utility levels to become approximately equal. Yet, in an examination of U.S. counties, we find empirical evidence of only slight ebbing of natural amenity-based migration after 2000 and little slowing of population redistribution from peripheral towards core urban areas. Instead, the primary finding is a downward shift in the responsiveness of relative population growth to spatially asymmetric demand shocks post-2000, and associated increased responsiveness of local area labor supply, more consistent with European regional labor markets. Additional sensitivity analysis, including instrumental variable estimation, confirms the result. Quantile regression analysis suggests that our findings are not due to a difference in regional labor market tightness between the 1990s and post-2000.

1. Introduction

Amongst the highest in the world, U.S. interregional labor migration flows have long been viewed as a critical component of U.S. labor market flexibility (Obstfeld and Peri, 1998) and economic performance. Internal migration has been shown to smooth out spatially-asymmetric macroeconomic shocks (Blanchard and Katz, 1992; Partridge and Rickman, 2006b) and the effects of industry restructuring such as those arising from the decline of manufacturing and agriculture (Dennis and Iscan, 2007). Further, internal migration drives regional differences in regional employment and population growth and possibly underlies U.S. advantages in innovation and growth (Crescenzi et al., 2007). The recent decline in gross internal migration, however, raises the possibility that the U.S. economy is nearing a spatial equilibrium. A change in the traditional role of migration in local labor markets would be an alternative explanation.

Persistent migration during the latter half of the twentieth century suggests that the U.S. economy was far from a stationary spatial equilibrium. For example, amenity migration has been a primary driver in the redistribution of population from the Frostbelt to the Sunbelt as U.S. income and wealth increased (Graves, 1979, 1980; Blanchard and Katz, 1992; Plane, 1993). Interregional migration also has been fueled by urban-hierarchy-based shocks, such as those related to changes in communications and transportation technologies and the ascendancy of higher-ordered services (Plane et al., 2005; Partridge et al., 2008b). High-skilled workers seeking to earn greater returns on their human capital form a basis for regional innovation and growth (Becker, 1962; Faggian and McCann, 2006, 2009; Glaeser and Resseger, 2010). An economy approaching a stationary spatial equilibrium would be characterized by greatly diminished net-migration flows as the values of site specific characteristics become capitalized into housing prices and wages (Greenwood et al., 1991).

Perhaps consistent with approaching of a spatial equilibrium, the United States recently experienced a secular decline in the rate of interregional migration. As shown in Fig. 1, beginning with the 1970s, the percentage of the population moving across counties or across states generally started to decline, but the decline became more dramatic at the end of the 1990s. The dramatic decline has led to reports that the U.S. has entered an era of "new localism"

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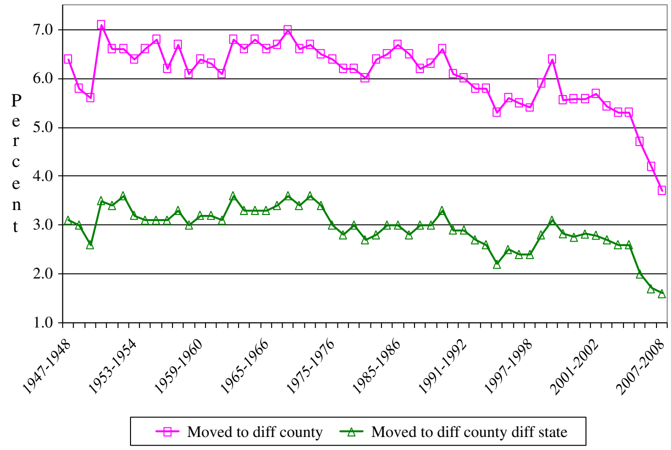
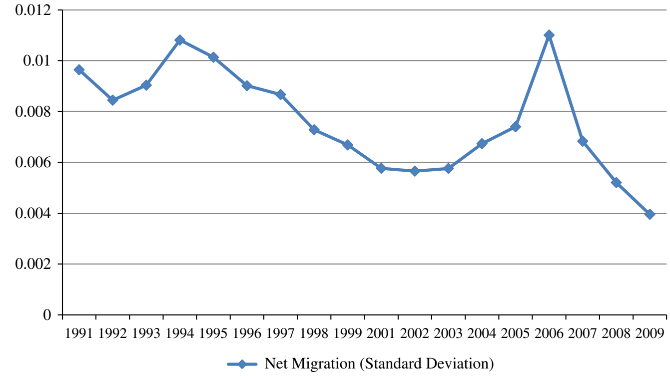


Source: U.S. Census Bureau, Current Population Survey, Table A-1. Annual Geographical Mobility Rates, By Type of Movement: 1947–2009, available at: http://www.census.gov/population/socdemo/migration/tab-a-1.pdf (accessed Sept. 13, 2010).

Fig. 1. Annual gross migration rates: 1947–2008.



Source: U.S. Census Bureau Intercensal Population Estimates (http://www.census.gov/popest/estimates.html)

Fig. 2. Standard deviation of annual state net migration as a share of initial population.

(Kotkin, 2009) and increased rootedness (Cooke, 2011), raising concerns that jobs would need to be created where people live (Fletcher, 2010). The recent Great Recession that began December 2007 appears to have magnified the post-2000 decline in the rate of migration (Saks and Wozniak, 2007; Frey, 2008).[4]

Regional scientists though focus more on differences in regional growth across U.S. regions than on gross migration flows, as much of gross migration can simply be churning between regions relating to personal considerations (e.g., divorce, marriage) or idiosyncratic matching effects. The more relevant issue then is how the decline in gross migration affected the net migration patterns (reflecting utility differentials) that drive regional growth differentials. Fig. 2 reports the standard deviation of annual county net migration rates (net migration divided by beginning year population) over the 1990–2009 period. The standard deviation of net migration rates experienced a secular decline over the period until 2002, then an upward spike until the peak of the housing bubble in 2006, followed by a sharp decline back to the pre-bubble trend.[5] While the peak of the housing bubble period was associated with an increase in net-migration differentials, possibly because the bubble was associated with an increased regional dispersion of housing prices (Sasser, 2010), the collapse of housing prices post-2006 and the ensuing recession that began in December 2007 rapidly reduced these differentials.

A question arises then whether net-migration and regional growth differentials will significantly rebound after the recession or whether the long-term trend of declining net migration will continue. U.S. population growth differentials may be more "permanently" at a lower level if the economy is nearing a spatial equilibrium in which location-specific attributes have largely been capitalized into local prices and interregional utility levels are nearly equal. Equalized utility levels would be manifested by an absence of net migration aside from the influences of "short-term" labor demand shocks (which would occur even in spatial equilibrium), or personal idiosyncratic migration. Alternatively, if there has been a change in the role of migration in smoothing out asymmetric demand shocks, migration would have a smaller role in regional economic growth differentials, representing a structural shift in U.S. labor markets.

Therefore, this study compares U.S. county population growth and interregional migration during the 1990s with that over the period 2000 to 2007. Because the latter period predates the recession, the comparison establishes whether there has been a longer term, rather than cyclical, shift in interregional migration dynamics. Factors examined include population growth and migration movements related to: natural amenities; proximity in the urban hierarchy; and asymmetric labor demand shocks.

The next section contains the theoretical framework, which demonstrates how the various factors can affect interregional migration and how their influence might change over time. Section 3 presents the empirical approach. General regression analysis, including instrumental variable estimation, and quantile regression analysis are described in Section 4. Among the primary results, there is some evidence of the diminishment of natural amenities as a force in the redistribution of population post-2000. We do not find any evidence that net population movements related to proximity in the urban hierarchy are ebbing—i.e., households continue to locate to areas more proximate to larger urban centers. Thus, consistent with the survey findings on well-being across U.S. states by Oswald and Wu (forthcoming) for 2005–2008, differences in utility arising from "innate state differences" (p. 15) do not appear to have been arbitraged away.

The most important shift appears to be that migration was the primary labor supply response to spatially-asymmetric labor demand shocks before 2000 while post-2000, the primary labor supply response is a change in the local employment rate. Possible explanations include a slack national labor market, which provide ample labor supply sources in most local labor markets, reducing the impetus for interregional migration. Likewise, increased variability of labor demand shocks may have caused risk-averse households to be less willing to migrate for jobs. Another possible explanation is increased labor mobility across industries, reducing the need for households to geographically migrate with job changes, possibly arising from reduced government regulation, reduced unionization and increased globalization (Kambourov and Manovskii, 2008). Further potential explanations include a decline in military transfers (Pingle, 2007) and the aging of the U.S. population. We explore the plausibility of these potential explanations in sensitivity analysis.

A structural shift *away* from the traditional large labor demand induced migration flows would suggest that U.S. regional labor markets have taken on a European flavor, in which asymmetric labor demand

[4] Kaplan and Schulhofer-Wohl (2010) argue that a change in the Census Bureau's imputation method in the March supplement to the Current Population Survey underlies the 2005–2006 dramatic drop in interstate gross migration flows shown in Fig. 1. However, their analysis of non-imputed data shows a significant sustained downward trend in migration after 2000. Moreover, our empirical analysis uses county-level data that are not based on the Current Population Survey and is unaffected by this imputation.

[5] Regression analysis confirms a statistically significant shift downwards in the standard deviation of net migration for the period of 2001–2007. The standard deviation of population growth rates parallels that for net migration over time. In their examination of Internal Revenue Service data, which is that used by the Census Bureau in constructing domestic migration estimates (http://www.census.gov/popest/topics/methodology/2009-stco-char-meth.pdf), Kaplan and Schulhofer-Wohl (2010) note a bump up in 2006 interstate migration, consistent with our Fig. 2 for the standard deviation of net migration rates.

shocks would have the largest effects on local unemployment and labor force participation rates rather than on interregional migration (Decressin and Fatás, 1995; Jimeno and Bentolila, 1998). Such a shift would fundamentally alter U.S. economic performance, in which adjustments to shocks may increase structural unemployment rates if labor is not moving to high growth regions, and it would provide additional justification for place-based economic development policies (Partridge and Rickman, 2006a,b). A brief summary and discussion of the results and suggestions for future research follow in the final section.

2. Theoretical framework

The decision to migrate derives from household utility maximization over location of residence. Human capital theory views migration as an investment decision, involving calculation of the net present value of moving in terms of associated discounted benefits (B) less costs (C) (Becker, 1962; Sjaastad, 1962). Benefits and costs include both monetary, and more subjective, non-monetary factors (e.g., psychic costs of moving). The household moves if its sum of net present values (NPV) over all time periods (T) is positive, where r is the discount rate:

$$\mathrm{NPV} = \left(\sum_{t=1}^{T}\frac{B_t}{(1+r)^t} - \sum_{t=1}^{T}\frac{C_t}{(1+r)^t}\right) > 0. \tag{1}$$

The calculation compares benefits and costs of the current location versus those of all other locations. Time-varying benefits and costs include local employment opportunities, wages, and housing costs. Any errors in forecasting benefits and costs will be captured by a stochastic term in empirical implementation.

The spatial equilibrium model extends basic human capital theory by defining NPV as including everything that affects the perceived utility of the potential mover, including subjective factors such as the relative amenity attractiveness of the area. Although many amenity attributes such as climate and topography are fixed, the value attached to them may increase with national income and wealth (Graves, 1980). Amenity attractiveness of an area also may be time variant, as it may be affected by the size of the local population. For example, access to numerous man-made amenities, such as cultural amenities, is greater in large cities (Glaeser et al., 2001). Differential amenity attractiveness, then, will provide migration relevant benefits to the extent that they have not already been capitalized into earnings and housing prices (Greenwood et al., 1991).

Monetary costs of migration include items such as moving truck rental costs and labor earnings forgone in the move. Migrants also incur psychic costs with the loss of social networks through increased distance from friends and family and with the loss of service provider relationships (Partridge and Rickman, 1997; Saks and Wozniak, 2007). The benefits and costs of moving can depend on personal attributes of the potential migrant such as age (Graves, 1979), marital status (Mincer, 1978; Blackburn, 2010) or ethnicity (Frey et al., 2005).

In spatial equilibrium, NPV should be less than or equal to zero for each household across the population. However, small changes in the factors underlying B and C can cause NPV to turn positive for households at the margin, inducing interregional migration (Saks and Wozniak, 2007). For example, an asymmetric macroeconomic or regional shock leads to migration until NPV once again becomes nonpositive for all households. Spatial equilibrium theory assumes that the migration response is sufficiently rapid to capitalize changing conditions into factor prices (Blomquist et al., 1988).[6]

Thus, in spatial equilibrium, when NPV is less than or equal to zero for all individuals across the population, indirect utility of residence (V), net of household relocation costs (M), should be equal to some level $\underline{V}$ across locations k (Partridge and Rickman, 1997):

$$\underline{V} = V(.)_k - M_k \quad for\,all\,k, \tag{2}$$

where indirect utility is a function of returns to labor, housing costs, and quality of life. The overall migration rate (Mig) during the adjustment for any time period t then depends on the sum of NPV across the U.S. population (N):

$$Mig_t = f\left(\sum_{i=1}^{N} NPV_{it}\right), \tag{3}$$

or equivalently, the extent Eq. (2) does not hold.

Continually changing conditions can produce sustained migration flows in an equilibrium framework though (Graves and Mueser, 1993) if they are not fully anticipated and capitalized into factor prices to produce equalized utility levels (Partridge et al., 2008b). Rising U.S. income and wealth increased the demand for natural amenities in the latter half of the twentieth century, producing sustained migration flows to the Sunbelt and other areas with attractive natural amenity attributes (Graves, 1980; Blanchard and Katz, 1992; Partridge and Rickman, 2006b). Aging of the population likewise can lead to population redistribution, including acting as one factor conditioning amenity migration (Graves, 1979; Rogerson and Kim, 2005). Changes in communications and transportation technology, the ascendancy of high-end services, and changing urban conditions or preferences for urban living can cause significant population redistribution across the urban hierarchy (Partridge et al., 2010).

The dramatic decline in the overall migration rate post-2000, however, suggests that one or more of these forces have waned. The weak national job growth following the 2001 recession may have reduced the incentive to migrate (Frey, 2008). Accompanying weak job growth post-2000 was a reduction in the standard deviation in employment growth across states.[7] If job prospects appear more uniformly weak, the incentive to migrate diminishes (Partridge and Rickman, 1999), while the slackness in the labor market provides internal labor supply sources for local job growth (Partridge et al., 2009a). In an analysis of U.S. internal migrants over a period exceeding fifty years, Saks and Wozniak (2007) in fact find migration to be pro-cyclical, particularly among younger workers.[8] Yet, based on Saks and Wozniak's (2007, p. 32) estimated regression of migration of males aged 25–34 and a measure of the national employment gap, migration rates in years 2000 and 2001 were above predicted levels, while those in 2002 and 2003 were below predicted levels. This suggests that other factors besides national labor market cyclicality were behind the slowdown in migration.

One such potential factor is amenity migration. Amenity migration could ebb because of slowing income growth, and capitalization of amenities into housing prices and wages by forward-looking agents (Cromartie and Wardwell, 1999; McGranahan, 2008; Rickman and Rickman, forthcoming). Thus, a spatial equilibrium may be approached where the values of amenities are largely capitalized into factor prices (Partridge, 2010). Likewise, if factor prices capitalize past shocks to the urban hierarchy, and further shocks are not

[6] Douglas (1997) and Nakajima and Tabuchi (2010) find that net migration flows are consistent with utility maximization (including transitivity) with preferences revealed by people voting with their feet. In an analysis of internal U.S. state migration flows, Greenwood et al. (1991) find that the assumption of spatial equilibrium could only be statistically rejected for a few states.

[7] Total U.S. employment (including proprietors) growth fell from an average for 1990–2000 of 1.8% to 1.2% for 2000–2007. The standard deviation of state total employment growth rates for the two periods likewise fell from 1.9% to 1.2% (U.S. Bureau of Economic Analysis, 2010).

[8] Saks and Wozniak (2007) also consider the influence of cyclicality in the national housing market, concluding that it is unlikely to be a factor in the cyclicality of migration. After accounting for the correlation of home ownership and the presence of children, they conclude that national fluctuations in moving costs are unrelated to the costs of selling homes.

forthcoming, proximity in the urban hierarchy will cease to produce population growth differentials (Partridge et al., 2008b). It is possible that wages and housing costs have fully capitalized past technological shocks, such as labor-saving productivity gains in agriculture or the advent of the internet, both of which greatly affected the relative productivity and livability of urban versus rural areas.

Therefore, the migration rate in an area k between time period 0 and t is related to the factors discussed above which affect the net present value calculations:

$$\mathrm{Mig}_{kt}=f(\mathrm{LDSHOCK}_{k0},\mathrm{INDUSTRY}_{k0},\mathrm{AMENITY}_{k0},\mathrm{URBAN}_{k0},\mathrm{DEMOG}_{k0},.), \quad (4)$$

where LDSHOCK reflects local labor demand shocks, such as those related to asymmetric macroeconomic shocks or local policy shocks, INDUSTRY denotes measures of medium and longer-term industry restructuring such as those occurring in agriculture, AMENITY denotes (non-capitalized) natural amenities such as pleasantness of climate, URBAN reflects shocks related to valuations of proximity in the urban hierarchy and urban agglomeration influences, DEMOG denotes demographic characteristics such as age, ethnicity and education of the local population; the final argument denotes all other factors which are captured by numerous other control variables discussed in the next section, including those employed in sensitivity analysis.

A stationary spatial equilibrium would be characterized by an absence of differential net migration across areas after accounting for “short-term” effects of demand shocks or migration occurring for personal reasons. This follows because household utility levels are equalized across areas in spatial equilibrium. In equilibrium, the amenity and urban hierarchy variables would have insignificant effects on net migration, in which their values to households and firms would have been capitalized into wages and housing prices to produce the equalized levels of utility. Approaching spatial equilibrium would be manifested through greatly diminished amenity and urban hierarchy effects on net migration across time. If this is not the case, changes in the response to asymmetric labor demand shocks (rather than spatial equilibrium) may underlie the observed reduction in gross migration.

3. Empirical implementation

We examine over 3000 U.S. counties in the lower 48 states and the District of Columbia.[9] As we expect differential effects based on the degree of agglomeration and the associated variation in industry and workforce composition, the counties are separated into four sub-samples. The first sub-sample consists of counties that are not part of any metropolitan area—nonmetropolitan counties.[10] We then construct a rural sub-sample by omitting micropolitan counties from the nonmetropolitan sub-sample. A rural county neither contains a ‘city’ of 10,000 people or greater, nor does it have tight commuting linkages to such a city. The final two sub-samples are created by dividing metropolitan area (MA) counties, referred to as urban in the discussion below, into those that are in MAs with less than 250 thousand people in 1990 (“small” MAs) and those that are part of MAs with more than 250 thousand people in 1990 (“large” MAs). The 250,000 threshold divides the MA counties into two approximately equal halves; other related studies suggest that the results would not be very sensitive to the threshold chosen (e.g., to a threshold of 500 thousand as in Partridge et al., 2008b).[11]

We examine two time periods for comparison: 1990–2000 and 2000–2007. The time periods chosen correspond to the post-2000 decline in migration and approximately fit the business cycle. As the Census intercensal population estimates are reported for July in 2007, our latter period precludes the Great Recession, which began in December 2007, from confounding our results.

The dependent variables consist of several measures related to population flows. First, we examine population growth (change in population divided by the initial population) because it is the most comprehensive measure that includes immigration and domestic migration, and its estimates at the county level are most accurate. As domestic migration may be intertwined with natural increases and immigration, population growth may be most reflective of spatial utility differentials; e.g., immigrants may be attracted by the same factors as domestic migrants and each may have causal effects on the other (Partridge et al., 2008a; 2009b). Yet, we also consider domestic net-migration over the period, divided by initial population, in sensitivity analysis, and find no substantive differences. In addition, we separately consider the rates of (domestic) out-migration and in-migration over the period. Finally, we examine the change in the employment-population ratio over the respective sample periods to confirm the migration findings regarding possible changes in regional labor market dynamics.

For each of the four sub-samples, our base specification for a given county i located in state s is:

$$\%\Delta\mathbf{POPGR}_{\mathbf{is}(t-0)} = \alpha + \lambda\mathbf{ECON}_{is0} + \varphi\,\mathbf{GEOG}_{is0} + \boldsymbol{\gamma}\mathbf{AMENITY}_{is0} + \delta\mathbf{DEMOG}_{is0} + \sigma_s + \varepsilon_{is(t-0)}, \quad (5)$$

where the dependent variables are the population change outcomes described above measured between periods 0 and t (i.e., 1990–2000 and 2000–2007). The dependent variables are annualized for comparability across the two periods. **ECON** reflects economic activity, **GEOG** is a vector of variables that measure the location's access to the urban hierarchy, **AMENITY** contains measures of natural amenities, and **DEMOG** contains demographic/human capital attributes. The regression coefficients are α, λ, φ, γ, and δ; σ_s are state fixed effects that account for common factors within a state; and ε is the residual.[12]

The primary variable in **ECON** is the industry mix employment growth for 1990–2000/2000–2007. The industry mix variable is the ‘share’ variable from shift-share analysis (Bartik, 1991; Blanchard and Katz, 1992), constructed by summing the products of the initial 1990/2000 industry shares (one-digit level) and the corresponding national U.S. growth rates.[13] Industry mix employment growth represents the overall growth rate that would occur in a county if all of its industries grew at their respective national growth rates. Variation in

[9] Using counties has the benefit that they range from very rural to highly urban. Unlike a city or MA, counties also do not suffer from selectivity bias in that counties that never “succeeded” by becoming cities are still in the sample. They also have the advantage that their borders are not affected by recent growth experiences (such as MAs). Following the U.S. Bureau of Economic Analysis, there are cases where independent cities are merged with the surrounding county to form a more functional region (mostly in Virginia). Forty three mostly small rural counties are omitted due to the lack of economic data.

[10] A metropolitan area (MA) is defined as a county or counties that contain a city of at least 50,000 in population, as well as additional counties with tight commuting linkages with the core urban area. Generally, we use the 2003 MA definitions. See the U. S. Census Bureau MA definitions for details.

[11] The use of counties has clear advantages as having a long tradition in regional economic studies due to the wider data availability and counties generally have functioning governments. However, using counties has some downsides. Counties are not functional labor markets, which may mean that we overstate migration across labor markets. County land size greatly varies across the country, with larger counties falling in western states; whereas counties have more regular shapes in the Midwest and Plains states. To some extent, these concerns are accounted for by breaking the sample into four depending on degree of urbanity, using state dummies, and controlling for land area.

[12] Using the STATA cluster command, the county residual is assumed to be spatially correlated with neighboring counties within their Bureau of Economic Analysis functional economic region but independent of county residuals in other regions. Accounting for spatial autocorrelation only affects the calculated standard errors.

[13] Industry mix employment growth for a county is calculated as $\sum_i (e_i/E)^* gn_i$, where e_i represents county employment in industry i, E is total county employment, and gn_i is the national growth rate of employment in industry i.

industry mix employment growth across counties originates from their having different industry compositions at the beginning of the respective period. If an industry experiences a national or international demand shock, it influences the county's industry mix growth rate through the degree of that industry's presence in the county. The use of industry mix growth as an independent variable allows for direct inference on how economic migration responds to differential demand shocks.[14]

If net newly created jobs associated with labor demand shocks are filled by new migrants, the industry mix variable will be positively associated with population growth (net migration). In contrast, to the extent that local labor supply fully satisfies local labor demand shocks, the industry mix variable will be unrelated to population growth (net migration). The industry mix variable coefficient in the employment rate (employment/population) change model is expected to have the opposite pattern.

GEOG contains various measures of access to the urban hierarchy. First are spatial distance measures that reflect proximity to urban areas differentiated by their tier in the hierarchy. The first such distance measure is that to the nearest urban center of *any* size including micropolitan areas. For a county that is part of a MA, this distance is from the population-weighted center of the county to the population-weighted center of the MA. *Within* an urban area, the influence of longer distances would reflect offsetting effects of concentration or sprawl. For a nonmetropolitan county, this variable is measured as the distance from the county center to the center of the nearest MA.[15]

Beyond the nearest urban center, we also include the incremental distances to more populous higher-tiered urban centers to capture the incremental or marginal costs to reach each higher-tiered (larger) urban centers. Included, are the incremental distance in kilometers from the county to reach a MA of any size, and the incremental (additional) distances to reach MAs of at least 250 thousand, 500 thousand, and 1.5 million people.,[16,17] The largest category generally corresponds to national and top-tier regional centers, with the 500 thousand–1.5 million category reflecting sub-regional tiers.[18]

The **GEOG** vector also includes the county's population, as well as the population of the nearest/actual urban center to account for the competing effects of urbanization economies and congestion. Finally, **GEOG** includes the county's land area measured in square miles. Land area should reflect several offsetting effects such as room for residential development (positively related to growth), but also greater distance *within* the county to reach services, customers, and amenities. If the economy was approaching a spatial equilibrium, where past urban hierarchy shocks became capitalized into factor prices, and further technological shocks did not occur, the estimated effects of the distance measures would decline over time.

We first account for natural amenities (**AMENITIES)** with a 1 to 7 scale constructed by the U.S. Department of Agriculture based on four measures of climate, proximity to water and topography, etc. (McGranahan, 1999). We also include three indicator variables for close proximity (within 50 km) to the Atlantic Ocean, Pacific Ocean, and the Great Lakes. If natural amenities become capitalized into factor prices (Cromartie and Wardwell, 1999; McGranahan, 2008), population growth in high amenity areas should slow towards the national average as net migration declines (Greenwood et al., 1991).

State fixed effects are included to account for state-specific factors such as policy differences, settlement period, or differing geographic size of counties (they tend to be larger in the west). Thus, omitting state fixed effects would create omitted variable bias. With the inclusion of state fixed effects, the other regression coefficients are interpreted as the average response for *within*-state changes in the explanatory variables, though at the expense of removing cross-state variation that may drive migration.

The **DEMOG** vector includes several variables associated with human capital and mobility, all measured in the initial period (see Appendix Table 1 for details). There are five variables measuring race or ethnicity; four variables measuring the educational attainment of the county's population; percent of the population that is female; percent of the population that is married, and the percent with a work disability. In sensitivity analysis we assess whether age or life cycle effects influence changes in migration patterns by controlling for six different age share variables and also appraise whether military transfers affect migration flows by controlling for the initial population share that is a member of the armed forces.

In yet further analysis we assess the role of the housing market. The housing bubble is unlikely to be a cause of declining migration as the latter pre-dates the emergence of the bubble around 2002. If anything, the housing bubble likely facilitated *greater* mobility. First, selling a house is easier when there is robust demand. Likewise, selling or buying a house usually requires paying a real estate commission and this is more readily affordable during rising housing prices, which is further facilitated by the general practice that sellers pay commissions at closing from the proceeds (Hryshko, et al., 2010). Likewise, the bubble was associated with increased regional dispersion of housing prices that may have encouraged migration to lower-cost housing markets (e.g., Sasser, 2010). Plunging housing prices after 2007 may have constrained migration because of a 'housing lock' that people could not sell their house (Roberts, 2009).[19]

To pursue this question, we first account for the initial-period share of the population that resides in owner occupied housing. If owner occupied housing is associated with additional moving costs due to attachment to the community and the transaction and liquidity costs related to selling/buying a home (Partridge and Rickman, 1997), this would lead to less out-migration, *all else equal*. Second, while a greater home ownership share is expected to be negatively associated with out-migration, there remains the related issue as to whether housing bubbles and busts (or labor market booms and

[14] Driven by national or international shocks, the industry mix growth rate is routinely used as an exogenous measure of overall local employment growth (Bartik, 1991; Blanchard and Katz, 1992; Treyz et al., 1993; Bound and Holzer, 2000). These studies were typically interested in the role of migration in filling newly created jobs. Thus the industry mix measure was used in 2SLS to instrument for overall employment growth in a migration or population growth equation. Following these studies we also use the industry mix growth rate variable as an instrument for overall employment growth in sensitivity analysis in Section 4.1.

[15] If it is a one-county urban center, this distance term is zero. Population-weighted county centroids are from the U.S. Census Bureau. The MA population category is based on initial year population—i.e., 1990 or 2000.

[16] For a county already located in a MA or micropolitan area, the incremental value to reach a micropolitan area or MA (of any size) would be zero. See Partridge et al. (2008b, 2010) for more details of the incremental distances and associated maps to illustrate their construction.

[17] Incremental distance is calculated as before. If the county is already nearest to a MA that is either larger than or equal to its own size category, then the incremental value is zero. For example, if the county's nearest urban center of any size is already over 250,000 people and 30 km away, then the nearest urban center is 30 km away and the incremental distance values for the nearest MA of any size and the nearest MA > 250,000 are equal to zero. As another example, suppose rural county A is 80 km from its nearest urban center of any size (say a micropolitan area), 100 km from its nearest MA of any size (say 150,000 population), 140 km from a MA > 250,000 people (say 400,000 population), 220 km from a MA > 500,000 (which happens to be 2 million). Then the incremental distances are 80 km to the nearest urban center, 20 incremental km to a MA of any size (100–80), 40 incremental km to a MA > 250,000 (140–100), 80 incremental km to a MA > 500,000 (220–140), and 0 incremental km to a MA > 1.5 million (220–220). See Partridge et al. (2008b, 2010).

[18] There may be measurement error bias when using straight-line distance rather than travel time. Yet, this classic measurement error would bias the distance regression coefficients toward zero. With the developed U.S. road system, such measurement error should be small. We expect any bias to be small based on Combes and Lafourcade's (2005) finding that the correlation between distance and French transport costs is 0.97.

[19] U.S. Census Bureau estimates suggest that gross migration rates across different counties and across different states were equal between 2007–2008 and 2008–2009, remaining at historic lows. The non-imputed migration data examined by Kaplan and Schulhofer-Wohl (2010) though suggest that migration did not decline by more than what would be predicted by the post-2000 downward trend during 2007 to 2010.

Table 1
Dependent variable: population growth (%/year) in U.S. counties.

	1990–2000 period				2000–2007 period			
	Non-metro	Rural	Small MA	Large MA	Non-metro	Rural	Small MA	Large MA
Intercept	2.769**	2.635**	3.822	−0.900	0.963	1.415*	0.338	−11.211**
	(2.57)	(2.00)	(1.48)	(−0.36)	(1.14)	(1.68)	(0.13)	(−2.34)
Ind mix emp	4.502***	4.147***	6.881**	8.050***	−2.161**	−2.399*	0.377	1.523
gr 1990–00/2000–07	(3.26)	(2.76)	(2.11)	(2.69)	(−2.19)	(−1.88)	(0.12)	(0.47)
Distance to	−0.010***	−0.009***	−2.3E−04	0.007**	−0.008***	−0.007***	−0.001	0.001
nearest or actual UC	(−8.22)	(−5.69)	(−0.08)	(2.36)	(−8.40)	(−6.53)	(−0.22)	(0.24)
Incremental dist to a metro	−0.004***	−0.004***	n.a.	n.a.	−0.003***	−0.003***	n.a.	n.a.
	(−5.60)	(−5.30)			(−5.73)	(−4.84)		
Inc. dist to	−0.003***	−0.003***	−0.004***	n.a.	−0.002***	−0.002***	−0.003***	n.a.
metro > 250,000 pop	(−5.60)	(−5.84)	(−5.70)		(−4.62)	(−5.95)	(−3.02)	
Inc. dist to	−0.002***	−0.002***	−0.002**	−0.002	−0.002***	−0.002***	−0.003***	−0.004**
metro > 500,000 pop	(−2.85)	(−2.98)	(−2.04)	(−1.54)	(−3.83)	(−3.20)	(−2.62)	(−2.41)
Inc. dist to	−0.001**	−0.001***	−0.002*	8.6E−05	−0.001**	−0.001***	−0.002*	−0.002*
metro > 1,500,000 pop	(−2.56)	(−2.96)	(−1.83)	(0.16)	(−2.31)	(−2.64)	(−1.95)	(−1.66)
County pop 1990/2000	−1.7E−06	7.5E−06	3.0E−10	−8.5E−08	6.0E−06***	2.1E−05***	−1.1E−07	−1.1E−07
	(−1.10)	(1.63)	(0.00)	(−1.46)	(4.31)	(5.04)	(−0.12)	(−1.13)
Pop of nearest	4.1E−07	1.6E−07	1.3E−06	4.2E−08*	4.3E−07***	2.5E−07*	2.7E−06***	2.5E−08
or actual MA 1990/2000	(1.15)	(0.50)	(1.34)	(1.65)	(2.95)	(1.87)	(3.28)	(0.81)
County area (sq miles)	4.0E−05	−2.5E−05	4.2E−05	−1.6E−05	3.5E−05	−4.8E−06	2.6E−05	−5.7E−05
	(0.79)	(−0.57)	(0.57)	(−0.34)	(0.77)	(−0.11)	(0.21)	(−0.99)
Amenity2 dummy	0.176	0.0003	0.745***	0.778**	0.266	−0.037	0.570***	1.528***
	(0.90)	(0.00)	(3.50)	(2.56)	(1.18)	(−0.29)	(2.95)	(3.35)
Amenity3 dummy	0.268	0.041	0.789***	0.634**	0.446**	0.140	0.487**	1.235***
	(1.33)	(0.27)	(3.29)	(2.32)	(2.00)	(1.08)	(2.03)	(2.73)
Amenity4 dummy	0.489**	0.277*	0.715***	0.567**	0.520**	0.198	0.210	1.030**
	(2.34)	(1.69)	(2.62)	(2.15)	(2.29)	(1.45)	(0.75)	(2.48)
Amenity5 dummy	0.915***	0.892***	1.062**	0.417*	0.764***	0.579***	0.135	1.223***
	(3.89)	(4.36)	(2.42)	(1.81)	(3.12)	(3.58)	(0.32)	(2.99)
Amenity6 dummy	1.146***	1.000***	0.915*	0.561***	0.835***	0.546*	0.034	0.589*
	(3.63)	(3.02)	(1.91)	(4.72)	(2.79)	(1.82)	(0.05)	(1.67)
Amenity7 dummy	1.499***	1.860***	0.644	(Dropped)	0.293	0.418	−1.547**	(Dropped)
	(4.40)	(4.19)	(1.02)		(0.90)	(1.30)	(−2.11)	
Great lakes	−0.053	0.010	−0.152	−0.149	−0.245***	−0.100	−0.120	−0.288*
	(−0.56)	(0.04)	(−0.97)	(−1.30)	(−3.52)	(−0.90)	(−0.83)	(−1.67)
Pacific Ocean	−0.776***	−0.814***	−0.312	−0.155	−0.083	−0.250	−0.290	−0.662
	(−3.21)	(−2.69)	(−0.89)	(−0.76)	(−0.45)	(−0.66)	(−0.56)	(−1.13)
Atlantic Ocean	−0.022	−0.074	0.234	−0.605***	0.182	0.085	−0.323	−0.642**
	(−0.13)	(−0.38)	(0.92)	(−4.40)	(1.24)	(0.65)	(−1.06)	(−2.08)
State fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Demographic vars 1990/2000	Y	Y	Y	Y	Y	Y	Y	Y
N	1970	1300	416	641	1970	1300	416	641
R-squared	0.522	0.557	0.604	0.642	0.523	0.552	0.516	0.483
F-stats: All dist = 0	17.92***	12.91***	8.63***	4.79***	18.04***	17.86***	3.27***	4.33***
Inc dist to MA = 0	12.55***	12.68***	11.43***	1.78	11.48***	11.67***	4.36***	5.61***
Amenity vars = 0	8.17***	9.10***	2.39**	5.46***	8.76***	5.23***	5.67***	3.49***

Notes: robust t-statistics from STATA cluster command are in parentheses. ***, **, and * indicate significant at 1%, 5%, and 10% respectively. Demographic variables include five ethnicity shares, four education shares, %females, % married, and % with a work disability.

busts) affect migration dynamics. To assess the latter issue, as described in the empirical analysis section, we also include the initial-period residuals from auxiliary regressions involving the county's median wage and median housing price. The wage and housing price residuals would capture the effects of the labor and housing markets being initially out of equilibrium or the effects of unmeasured amenities (Clark et al., 2003). To be sure, any differences due to a general uniform national pattern of bubble/bust in the housing market would show up in the respective time period's constant term.

4. Empirical results

Appendix Table 1 contains the variable definitions and data sources; Appendix Table 2 displays the descriptive statistics. Table 1 presents the base model population growth results. Annualizing the dependent variables allows for direct comparability of the results across periods of different length. Our assessment of the decline in migration involves a comparison of the results for the 1990 to 2000 period with those for the 2000 to 2007 period for each sub-sample. We discuss the major variable categories in turn below.

4.1. Base population growth results

4.1.1. Industry mix employment growth

The industry mix job growth coefficient is positive and statistically significant in the 1990s sub-samples, consistent with its interpretation as reflecting migration responses to demand shocks (Bartik, 1991; Blanchard and Katz, 1992; Treyz et al., 1993; Bound and Holzer, 2000). Yet, the industry mix growth coefficient turns unexpectedly negative or statistically insignificant in the post-2000 period. The null hypothesis that the 2000–2007 industry mix coefficient is *not less* than the corresponding coefficient for the 1990s can be rejected at the 1% level for nonmetropolitan and rural samples ($t = 3.93$, 3.32), but only at the 10% level for the small and large MA samples ($t = 1.44$, 1.48). In the latter two cases, the lower significance relates to the imprecision of the regression coefficients with their standard errors being two to three times larger than the

Table 2
Population growth (%/year) in U.S. counties: impact at mean values (coeff*mean).

	1990–2000 period				2000–2007 period			
	Nonmetro	Rural	Small MA	Large MA	Nonmetro	Rural	Small MA	Large MA
Average pop growth (%/year)	0.595	0.478	1.266	1.544	−0.092	−0.279	0.747	1.094
Ind mix emp gr 1990–00/2000–07	0.934	0.869	1.445	1.730	−0.127	−0.148	0.021	0.085
Distance to nearest or actual UC	−0.410	−0.523	−0.004	0.198	−0.326	−0.410	−0.016	0.029
Incremental dist to a metro	−0.225	−0.178	n.a.	n.a.	−0.182	−0.131	n.a.	n.a.
Inc. dist to metro > 250,000 pop	−0.218	−0.247	−0.389	n.a.	−0.133	−0.174	−0.235	n.a.
Inc. dist to metro > 500,000 pop	−0.073	−0.084	−0.074	−0.058	−0.074	−0.081	−0.108	−0.127
Inc. dist to metro > 1.5 mil. pop	−0.079	−0.096	−0.120	0.009	−0.064	−0.076	−0.141	−0.177
County pop 1990/2000	−0.038	0.103	0.000	−0.023	0.147	0.306	−0.009	−0.033
Pop of nearest or actual MA1990/2000	0.027	0.012	0.180	0.071	0.031	0.020	0.420	0.048
County area (sq miles)	0.043	−0.026	0.038	−0.014	0.038	−0.005	0.023	−0.049
Amenity2 dummy	0.028	0.000	0.113	0.070	0.042	−0.006	0.086	0.138
Amenity3 dummy	0.109	0.017	0.283	0.268	0.182	0.057	0.174	0.522
Amenity4 dummy	0.151	0.086	0.253	0.189	0.161	0.062	0.074	0.344
Amenity5 dummy	0.076	0.079	0.069	0.033	0.064	0.051	0.009	0.095
Amenity6 dummy	0.035	0.026	0.040	0.030	0.025	0.014	0.001	0.031
Amenity7 dummy	0.013	0.009	0.008	n.a.	0.003	0.002	−0.019	n.a.
Great lakes	−0.001	0.000	−0.007	−0.009	−0.007	−0.002	−0.006	−0.017
Pacific Ocean	−0.007	−0.004	−0.007	−0.005	−0.001	−0.001	−0.007	−0.022
Atlantic Ocean	−0.001	−0.002	0.023	−0.126	0.007	0.003	−0.032	−0.134
N	1970	1300	416	641	1970	1300	416	641

Notes: the table reports the regression coefficient reported in Table 1 multiplied by the variable mean.

corresponding nonmetropolitan and rural coefficients, suggesting the need for further assessment to confirm whether the pattern is robust in other settings.

A possible explanation for the falling importance of demand shocks to migration patterns is that U.S. local labor markets took on more of a European flavor post-2000 with a lesser role for economic migration in smoothing out asymmetric demand shocks and driving regional growth differentials (e.g., Decressin and Fatás, 1995; Jimeno and Bentolila, 1998), and a greater role for internal labor supply. Alternatively, it may be that industry mix-based growth was no longer correlated with overall employment growth, making it a poor labor demand measure. However, for both the metropolitan and nonmetropolitan samples, the correlation between total employment growth and the industry mix employment growth term is nearly twice as large in the latter period. To further consider this issue, in results not shown, we re-estimate the models by replacing the industry mix growth variable with an instrumented measure of place-of-work job growth (using data from the U.S. Bureau of Economic Analysis). Because job growth is endogenous, we use the industry mix growth rate as the identifying instrument (consistent with the previous studies discussed in footnote 14). The first-stage models also suggest that industry mix is a strong predictor of employment growth in both periods, and if anything, it is stronger in the post-2000 period. The value of the Angrist–Pischke multivariate F test of excluded instruments was over 15.50 in all cases post 2000, suggesting that industry mix did not become a weaker predictor of labor demand shifts. The second-stage IV results continue to suggest that employment growth had a strong effect on migration in the earlier period, while its influence was statistically insignificant in the latter period.

We also examine whether the results are an artifact of other structural changes post-2000. Industry mix growth after 2000 may have been different, perhaps due to globalization, becoming associated with greater variability. Local labor markets with greater variability will be less attractive if households are risk averse (Jaeger et al., 2010), causing industry mix employment growth to have less of an effect.

Thus, we constructed an industry-mix standard deviation of employment growth akin to the industry mix growth rate. Specifically, we calculated the standard deviation of national annual employment growth for each one-digit industry over the 1990–2000 and 2000–2007 periods. For each county, we then multiplied the standard deviation by the corresponding 1990 or 2000 county industry employment share and summed these over all industries. The result is the *expected* standard deviation of county employment growth if all of the county's industries are as variable as their national counterparts. If workers are becoming more sensitive to variability, this variable should be more negatively significant in the latter period. In results not shown, we found the expected negative association between population growth and the industry mix standard deviation variable in the latter period, while the relationship was insignificant in the 1990s. In both periods though, the industry mix *growth* results were mostly unaffected, further confirming our key findings on population responses to demand shocks.

4.1.2. Urban proximity/agglomeration

Comparisons of the results for the measures of urban proximity between the two periods across the sub-samples suggest very little temporal change, with perhaps a slight decrease in the effects of remoteness. This marks a change from increasing economic penalties for remoteness in the latter-half of the 20th Century reported in Partridge et al. (2008b). Even so, the results are not consistent with the significant slowdown of migration. Overall, among the twelve distance variables reported in each time period, there is not one case in which the coefficients are statistically different from one another at the 10% level.

The regression coefficients for the own-county population variable and the population of the closest or own MA generally increased in size in the latter period and became statistically significant in the nonmetropolitan and small MA sub-samples. Yet, the effect slightly weakened for the large MA sample in the latter time period. Taken together with the results for the distance measures, the effects of proximity to urban areas and agglomeration economies on population growth do not appear to have markedly shifted over the two periods. Forces that have not been fully capitalized into factor prices appear to be continuing to drive core-periphery growth dynamics, indicating the national economy is not near a stationary spatial equilibrium.

4.1.3. Amenities

As for the natural amenity dummy variable coefficients, we interpret them relative to the omitted category—the lowest amenity category with a scale rank of 1. The results reveal clear changes across the two periods.

For the two 1990–2000 nonmetropolitan sub-samples, having an amenity rank between 4 and 7 was significantly and positively related

Table 3
Dependent variable: difference in employment-population (18+ years) ratio in U.S. counties.

	1990–2000 period				2000–2007 period			
	Non-metro	Rural	Small MA	Large MA	Non-metro	Rural	Small MA	Large MA
Intercept	−0.077*	−0.066	0.004	0.137***	−0.123***	−0.120**	0.015	−0.052
	(−1.80)	(−1.25)	(0.05)	(2.59)	(−2.66)	(−2.03)	(0.18)	(−0.70)
Ind mix emp gr	0.200***	0.140**	0.222***	0.269***	0.725***	0.744***	0.547***	0.513***
1990–00/2000–07	(4.41)	(2.47)	(3.03)	(2.95)	(9.65)	(7.42)	(5.10)	(4.00)
Distance to	−8.2E−05*	−9.7E−05*	2.8E−04**	8.2E−05	−4.3E−05	−3.1E−05	−5.4E−04***	−3.3E−04***
nearest or actual UC	(−1.85)	(−1.81)	(2.18)	(0.66)	(−0.77)	(−0.42)	(−3.07)	(−3.45)
Incremental	−6.1E−05**	−8.7E−5***	n.a.	n.a.	1.3E−05	−1.1E−05	n.a.	n.a.
dist to a metro	(−2.21)	(−2.79)			(0.37)	(−0.28)		
Inc. dist to	−5.7E−05**	−6.2E−05*	−7.9E−05***	n.a.	−3.0E−05	−5.4E−05	7.9E−05**	n.a.
metro > 250,000 pop	(−2.28)	(−1.81)	(−2.87)		(−1.31)	(−1.63)	(2.02)	
Inc. dist to	−7.7E−05***	−6.4E−05**	−3.0E−05	−3.6E−05	−8.1E−06	−2.0E−05	1.1E−04***	1.1E−04***
metro > 500,000 pop	(−3.47)	(−2.25)	(−0.82)	(−1.32)	(−0.33)	(−0.62)	(2.71)	(3.48)
Inc. dist to	−1.8E−05	−7.7E−06	4.0E−05	−7.9E−06	2.2E−05	4.8E−05*	8.1E−05***	−1.5E−05
metro > 1.5 mill pop	(−1.31)	(−0.42)	(1.46)	(−0.45)	(1.05)	(1.85)	(2.61)	(−0.65)
County pop 1990/2000	−3.6E−08	2.1E−07*	−1.7E−08	−8.8E−10	−4.1E−08	−2.3E−07	5.0E−08*	4.2E−09*
	(−0.67)	(1.73)	(−0.50)	(−0.53)	(−0.76)	(−1.48)	(1.69)	(1.94)
Pop of nearest	1.9E−08**	1.9E−08**	−3.3E−08	2.0E−10	5.4E−09	4.6E−09	−4.3E−08	−1.4E−10
or actual MA 1990/2000	(2.27)	(2.30)	(−0.73)	(0.46)	(0.71)	(0.55)	(−0.92)	(−0.28)
County area (sq miles)	−2.4E−06	−3.8E−06**	6.4E−06**	−5.0E−07	3.2E−07	1.2E−06	−3.4E−06*	8.9E−07
	(−1.19)	(−2.42)	(2.20)	(−0.49)	(0.20)	(0.45)	(−1.74)	(0.88)
Amenity2 dummy	−0.017*	−0.019**	−0.016	−0.003	−0.029***	−0.034***	0.002	−0.037***
	(−1.81)	(−2.43)	(−1.48)	(−0.14)	(−3.99)	(−4.76)	(0.17)	(−2.82)
Amenity3 dummy	−0.018*	−0.023**	−0.012	−0.003	−0.030***	−0.038***	0.011	−0.036***
	(−1.74)	(−2.20)	(−1.07)	(−0.16)	(−3.80)	(−4.83)	(0.82)	(−2.85)
Amenity4 dummy	−0.021*	−0.026**	−0.011	−0.003	−0.022***	−0.030***	0.013	−0.033***
	(−1.92)	(−2.35)	(−0.99)	(−0.19)	(−2.66)	(−3.64)	(0.89)	(−2.64)
Amenity5 dummy	−0.018	−0.025**	−0.013	0.005	−0.017*	−0.026**	0.013	−0.015
	(−1.48)	(−2.04)	(−0.88)	(0.35)	(−1.77)	(−2.35)	(0.83)	(−1.15)
Amenity6 dummy	−0.004	−0.006	−0.033**	0.008	−0.022	−0.030	0.028*	−0.010
	(−0.28)	(−0.42)	(−2.13)	(0.69)	(−1.44)	(−1.18)	(1.74)	(−1.14)
Amenity7 dummy	0.005	−0.019	−0.117**	(Dropped)	−0.044	−0.055	0.033	(Dropped)
	(0.25)	(−0.98)	(−1.99)		(−1.51)	(−1.02)	(0.95)	
Great lakes	−0.001	−0.015*	−0.013*	0.012***	0.003	0.009	−0.007	−0.003
	(−0.20)	(−1.65)	(−1.78)	(3.15)	(0.46)	(0.84)	(−1.30)	(−0.85)
Pacific Ocean	−0.011	−0.002	0.059*	−0.001	0.007	0.021	0.009	0.015*
	(−1.30)	(−0.12)	(1.93)	(−0.12)	(0.67)	(0.78)	(0.50)	(1.92)
Atlantic Ocean	0.004	0.005	−0.001	−0.005	−0.0001	−0.003	0.018**	0.013*
	(0.84)	(0.91)	(−0.18)	(−0.96)	(−0.02)	(−0.29)	(2.23)	(1.94)
State fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Demographic vars 1990/2000	Y	Y	Y	Y	Y	Y	Y	Y
N	1970	1300	416	641	1970	1300	416	641
R-squared	0.396	0.425	0.508	0.398	0.310	0.295	0.560	0.537
F-stats: All dist = 0	3.57***	2.74**	4.67***	1.11	1.11	1.55	6.04***	15.71***
Inc dist to MA = 0	4.00***	2.87**	3.23**	0.87	0.77	1.69	4.93***	7.44***
Amenity vars = 0	1.94*	2.31**	1.68	0.45	4.39***	4.71***	1.77	2.80**

Notes: robust t-statistics from STATA cluster command are in parentheses. ***, **, and * indicate significant at 1%, 5%, and 10% respectively. Demographic variables include five ethnicity shares, four education shares, %females, % married, and % with a work disability.

to population growth. This effect weakened after 2000 for counties with amenity rank of 5 through 7. For the small MA sample, there is a decline in the magnitude and statistical significance of the amenity rank 4 to 7 coefficients. In the large MA sample, increased amenity attractiveness occurred for all ranks relative to rank 1, except rank 6 counties for which there was little change. Overall, only in the case of amenity rank 7 counties is there evidence of a statistically significant decrease in the response to amenities. The proximity to Ocean or Great Lakes dummy variable results do not reveal a clear pattern, though the state fixed effects likely capture much of their effects. Generally, the results suggest that the net effects of amenities have become somewhat weaker in the first decade of the 21st Century (Rickman and Rickman, forthcoming), but there is no clear signal that a stationary spatial equilibrium has been reached in terms of natural amenity migration.

4.1.4. Using net-migration in place of population growth

We next replaced population growth as the dependent variable with the rate of net-migration. However, the results (not shown) were very similar, suggesting that the underlying forces driving population growth differentials also drive domestic net-migration. Estimated responses for domestic and international migrants combined also were consistent with the population growth estimates.

4.1.5. Summary of base model results

Table 2 presents the population growth effect for each variable, obtained by multiplying the mean of each variable by the corresponding regression coefficient in Table 1. At the top of Table 2 is the average population growth for each group for comparison. The most prominent pattern is the decline in importance of industry mix employment growth. The change in the effect of industry mix employment on population growth across the periods is substantial. In the nonmetropolitan sample, industry mix employment growth on average was associated with 0.934% population growth in the earlier period versus only −0.127% in the latter period. For the large metropolitan sample, the corresponding effects were 1.73% and 0.085%.

Table 2 also reveals slight diminishment in the negative population growth effects from remoteness for the nonmetropolitan samples and a modest increase in the role of local agglomeration economies for the small metropolitan sample. Generally, changes in

Table 4
Difference in 75–25 interquantile regression results.

	1990–2000 period				2000–2007 period			
	Non-metro	Rural	Small MA	Large MA	Non-metro	Rural	Small MA	Large MA
Ind mix emp growth rt.								
1990–00/2000–07	.5216	−0.2604	5.7258	5.7987	1.2198	−0.4449	0.9220	7.7046*
	(0.38)	(−0.14)	(1.29)	(1.37)	(1.05)	(−0.28)	(0.15)	(1.69)
N	1972	1300	416	641	1972	1300	416	641
.75 psuedo R^2	0.3471	0.3892	0.4506	0.4663	0.3441	0.3764	0.4118	0.4067
.25 psuedo R^2	0.3215	0.3602	0.3917	0.4132	0.3560	0.3846	0.3267	0.2719

Notes: the coefficients are the *difference* between the industry mix regression coefficients in a 75th percentile quantile regression model and the corresponding coefficient in the 25th percentile regression model. In parentheses are the bootstrapped t-statistics for the statistical significance between the two estimates using 250 repetitions.

agglomeration economies and distance penalties do not suggest that a spatial equilibrium has been achieved in terms of rural-urban patterns.

For the nonmetropolitan and rural counties, there is increasing migration to places with lower amenity rank counties (rank 2 or 3) and generally less migration to locations with higher amenity ranks. The small MA counties experience diminished migration across all amenity ranks above 1. The changes are quantitatively more substantial than those arising from agglomeration economies and remoteness but do not appear to be supportive of reaching a spatial equilibrium.

Therefore, our conclusion is that the decline of migration is not attributable to the U.S. nearing some stationary spatial equilibrium in which site-specific forces have been mostly capitalized into factor prices. Declining responsiveness to differential economic shocks (in the form of migration) appears to be the most prominent change pre-2000 and post-2000.

4.2. Changes in employment/population rates

If labor demand shocks are eliciting smaller net-migration responses post-2000, there must be larger changes in local labor supply responses. Thus, we would expect changes in industry mix employment growth to have a larger marginal influence on county employment rates (employment/population) in the latter period. To assess the response of employment/population, we regress the 1990–2000 and 2000–2007 changes in the ratios on the same independent variables used in our base population growth model. The county employment data are obtained from the U.S. Bureau of Labor Statistics local area unemployment series. Population is county population that is 18 years of age or older, derived from U.S. Census Bureau local population estimates. An advantage of using employment data from a different source is that it avoids creating a potential source of statistical bias (Bartik, 1993).

As shown in Table 3, the nonmetropolitan area results suggest that for every one percentage point increase in employment growth because of a favorable industry composition, employment/population rose by 0.2 percentage points in the 1990s, but by over 0.7 percentage points between 2000 and 2007. Similarly, in the two metropolitan samples, a corresponding increase in industry mix employment growth increases employment/population by just over a 0.2 percentage points in the 1990s but by over 0.5 percentage points increase post-2000. A considerably larger share of local labor demand shocks appears to be have been satisfied by local labor supply post-2000, consistent with a declining role for net economic migration as a labor supply source. The statistical significance of the 2000–07 industry mix variable in the employment/population models reinforces our conclusion that the (insignificant) *population growth* findings in Section 4.1 are not an artifact of the industry mix variable becoming a weaker indicator of labor demand shifts over time. Likewise, the null hypothesis that the 2000–2007 industry mix coefficient is *not greater* than the corresponding coefficient for the 1990s can be rejected at the 1% level for nonmetropolitan, rural, and small MA samples (respectively, t = 5.98, 5.24, 2.50), and at the 10% level for the large MA sample (t = 1.55), though the large metropolitan standard error is again considerably larger than the others.

4.3. Comparative economic expansions and migration

One potential explanation for the decline in the population growth or net migration response to demand shocks is that the 1990s labor markets were robust, while the labor markets post-2000 generally were tepid, likely resulting from a significant drop in the labor share of production from strong productivity growth during the economic expansion. This suggests that the reduction in population growth responses to differential regional shocks was attributable to greater excess labor in most regions in the slower post-2000 economy, with positive labor demand shocks more often supplied by local labor. A larger positive population growth response to industry mix growth then would be expected in areas with strong labor markets. In weaker regional labor markets, labor demand shocks would be satisfied locally, suggesting a smaller industry mix coefficient in the population growth equation.

To assess whether there are differences across labor markets of varying strength, we estimate quantile regressions for the 10th, 25th, 50th, 75th, and 90th percentiles. With only a slight exception described below, we found no substantive differences across the distributions, and so Table 4 only reports the corresponding results for the *differences* in quantile industry mix coefficients between the 75th and 25th percentiles of the population growth distributions. In parentheses are the bootstrapped t-statistics using 250 repetitions to test whether the differences between the two distributions are statistically significant.

The results in Table 4 suggest that in seven of the eight cases, there was no statistically significant difference between the industry mix regression coefficients of the 75th and 25th percentiles of the distribution. The sole exception is the larger 2000–07 industry mix coefficient for the 75th percentile regression, with a t-statistic of 1.69,[20] though the difference between the corresponding 90th and 10th percentiles is statistically insignificant (t = 1.18). Thus, it does not appear that the shift in industry mix coefficients across periods is simply a business cycle phenomenon, suggesting there are structural changes in economic migration across the entire distribution of fast and slow growing localities.[21]

[20] Using 1000 repetitions for bootstrapping t-statistics also yielded a corresponding value of 1.69.

[21] We also added the square of industry mix, but found no evidence of a positive coefficient.

4.4. Multicollinearity and sorting

Traditional migration models postulate that causation runs from the local area's demographic composition to migration. A location with a greater share of educated workers, for example, would be attractive to firms and households, leading to greater net in-migration (e.g., Glaeser and Shapiro, 2003; and Glaeser and Resseger, 2010). This process underlies our inclusion of key demographic features in the population growth model.

An alternative argument is that forward-looking agents self-sort into places they expect will experience future economic growth. For instance, the more educated would especially try to locate in places with a 'favorable' industry composition because they would earn the highest returns on their skill. Such self-sorting would potentially create endogeneity and increase multicollinearity between the demographic variables and the industry mix growth rate. Hence, we next omit all demographic variables from the base model to provide a more parsimonious reduced form. These results are not reported for brevity, but the industry mix results closely follow those in Table 1, suggesting that demographic sorting of all types does not underlie the changes in how industry shocks influence migration. We also again find a slight general decline in amenity-related population growth post-2000.

4.5. Sensitivity analysis for the population growth results

We next assess the robustness of our results to alternative hypotheses of why population growth patterns changed over the decade. First, Pingle (2007) contends that a key reason for the long-term decline in gross migration flows is the decline in military transfers. Military migration would mostly affect the relative growth rates of locations with military bases. To examine this possibility, Panel A of Table 5 reports the results obtained from adding the county's share of total employment that is in the armed forces. As expected, with the military downsizing after the Cold War, the armed forces employment share coefficient is generally negative and statistically significant. The other results are virtually identical as those in Table 1 though, especially for the key industry mix growth variable.

Another possible confounding influence is potential initial disequilibria in the housing and labor markets. We appraise this using a two-step process. In the first step we estimate auxiliary regressions that respectively use the initial-period median wage and median housing price as the dependent variable. The explanatory variables in the auxiliary regressions follow from Partridge et al. (2010). The resulting residuals are interpreted as the degree to which the county's labor and housing markets were initially out of equilibrium (Clark et al., 2003). The residuals also may represent unmeasured amenities,

Table 5
Selected sensitivity analysis regression results.

	1990–2000 period				2000–2007 period			
	Non-metro	Rural	Small MA	Large MA	Non-metro	Rural	Small MA	Large MA
Panel A								
Ind mix emp growth rt.	4.89***	4.44***	8.06***	8.89***	−2.08**	−2.39*	2.27	3.90
1990–00/2000–07	(3.58)	(2.99)	(2.60)	(3.13)	(−2.11)	(−1.88)	(0.72)	(1.24)
Armed Forces Emp	−0.045***	−0.149***	−0.072***	−0.086***	−0.024	0.092	−0.073***	−0.121***
Share 1990/2000	(−2.72)	(−3.19)	(−3.84)	(−5.95)	(−1.51)	(0.53)	(−2.93)	(−5.01)
N	1970	1300	416	641	1970	1300	416	641
R^2	0.526	0.562	0.630	0.668	0.524	0.552	0.536	0.520
Panel B								
Ind mix emp growth rt.	5.28***	4.97***	7.72**	9.28***	2.48**	2.92**	0.61	1.79
1990–00/2000–07	(3.47)	(2.99)	(2.18)	(2.88)	(2.24)	(2.05)	(0.18)	(0.46)
Resids from log	−0.07780	0.0960	−0.1670	0.5527	0.4012	0.3629	1.2177	1.8808**
(avg. wage) 1990/2000	(−0.25)	(0.27)	(−0.18)	(0.94)	(1.19)	(1.03)	(1.08)	(2.29)
Resids from log	1.3969***	1.3396***	1.5148**	1.0812**	1.6080***	1.4954***	1.1606	0.3226
(avg. rent) 1990/2000	(4.55)	(4.08)	(2.55)	(2.38)	(5.49)	(4.19)	(1.22)	(0.36)
N	1970	1300	416	641	1970	1300	416	641
R^2	0.5326	0.5675	0.6107	0.6470	0.5367	0.5641	0.5215	0.4899
Panel C								
Ind mix emp growth rt.	6.86***	6.26***	8.37***	11.44***	−0.77	−1.52	2.35	8.16**
1990–00/2000–07	(5.38)	(4.48)	(3.08)	(4.40)	(−0.66)	(−1.01)	(0.77)	(2.34)
Pop share 7–17	−0.163***	−0.115***	−0.206*	−0.103	−0.1636***	−0.1302***	−0.3035***	−0.500***
	(−4.62)	(−2.96)	(−1.85)	(−0.96)	(−4.78)	(−3.70)	(−2.69)	(−4.00)
Pop share 18–24	−0.070**	−0.036	−0.092	0.017	−0.0913***	−0.0718**	−0.1169	−0.296***
	(−2.28)	(−1.07)	(−1.14)	(0.25)	(−3.05)	(−2.10)	(−1.34)	(−3.17)
Pop share 25–54	−0.034	−0.007	−0.102	0.093	−0.1148***	−0.0850***	−0.1448	−0.240**
	(−1.12)	(−0.19)	(−1.18)	(1.29)	(−3.95)	(−2.62)	(−1.46)	(−2.06)
Pop share 55–59	−0.060	0.021	−0.292**	−0.41***	−0.0806*	−0.0341	−0.3082**	−0.583***
	(−1.19)	(0.35)	(−2.04)	(−3.57)	(−1.82)	(−0.700)	(−2.02)	(−5.70)
Pop share 60–64	0.071	0.093**	−0.041	−0.177	−0.0541	−0.0417	−0.2051*	−0.485***
	(1.40)	(2.08)	(0.29)	(−1.12)	(−1.19)	(−0.76)	(−1.65)	(−3.80)
Pop share 65+	−0.141***	−0.111***	−0.190**	−0.028	−0.1841***	−0.1579***	−0.2388**	−0.354***
	(−4.82)	(−3.43)	(−2.13)	(−0.40)	(−6.86)	(−5.10)	(−2.60)	(−3.62)
N	1970	1300	416	641	1970	1300	416	641
R^2	0.5636	0.5931	0.6402	0.7014	0.5739	0.5944	0.5876	0.5625
Panel D								
Ind mix emp growth rt.	4.51***	4.14***	5.33	7.53**	−10.76***	−10.36***	−4.88	−20.79**
1990–00/2000–07	(3.20)	(2.79)	(1.57)	(2.27)	(−4.83)	(−3.67)	(−0.76)	(−2.43)
Occup. mix emp growth rt.	−0.39	−0.50	6.92	3.05	20.77***	18.80***	13.52	54.18***
1990–00/2000–07	(−0.16)	(−0.19)	(1.19)	(0.41)	(4.65)	(3.61)	(0.93)	(2.97)
N	1970	1300	416	641	1970	1300	416	641
R^2	0.522	0.557	0.606	0.642	0.532	0.560	0.518	0.494

but if they are fully capitalized into wages and housing prices, the residuals would be unrelated to population growth differentials.

The second step of this process is to include the initial-period wage and housing cost residuals in the base population growth model; i.e., we include the 1990 residuals in the 1990–2000 population growth model and the 2000 residuals in the 2000–2007 population growth model. These results are reported in Panel B of Table 5. The wage residual results are generally statistically insignificant except for the positive coefficient in the large MA sample, which suggests a positive labor supply response to the higher than expected (or above long-run equilibrium) wages.

Except for the 2000–2007 large MA regression, the housing residual variable also is positive and statistically significant. The housing price residual coefficients are about the same magnitude for both 1990 and 2000, suggesting no structural change. Migration responses to demand shocks appear to occur *after* housing prices have responded to the shock. Yet, the evidence does not suggest that locations with unexpectedly high housing costs had lower migration; i.e., the results are not supportive of a hypothesis that local housing bubbles reduced growth differentials by deterring migration. Finally, the other results remain approximately unchanged, including the key industry mix results shown in the table.

We further examine the potential role of housing by separately considering domestic in- and out-migration rates, while controlling for the share of households that own a house. The regression results reveal the expected patterns. Higher homeownership rates are inversely associated with both in- and out-migration (results not shown due to brevity). The marginal responses to homeownership rates were remarkably stable across the two periods. While there are some changes in variable coefficients across the two periods, there are no remarkable shifts that explain the patterns we report in Sections 4.1–4.4. Adding immigrants to the respective domestic migrant streams produces the same results.[22]

A third possibility is that the industry mix job growth and the amenity results could be sensitive to the age composition, especially with a modestly aging population over time (Cooke, 2011).[23] Because it influences migration patterns across all locations, the national component of the influence of age on migration would mostly be captured in the intercept term. However, within a given a state (because state age factors are captured in the state fixed effect), there could be differential age-composition effects if a given county's age distribution greatly differs from the state average. Thus, we account for these local differential age effects by adding six age distribution shares to the base population growth models shown in Table 1. These results are reported in Panel C in Table 5.

Despite potential self-sorting issues discussed above with respect to age, the industry mix results for nonmetropolitan and small metropolitan counties are approximately unchanged in these models. The results for large metropolitan counties are modestly different. First, the industry mix variable is now positive and statistically significant for the 2000–2007 period, though the coefficient is of smaller magnitude than in the 1990–2000 model. Second, the amenity coefficients are of smaller magnitude in both the 1990–2000 and 2000–2007 models (not shown), but this does not alter our conclusion that changes in amenity migration were not a substantial contributor to the post-2000 decline in net-migration. Overall, our results are generally robust to adding the age share variables.

A fourth possible confounding influence could arise from labor demand shocks becoming increasingly associated with skill and occupation and less with industry. This could occur if workers become more mobile across industries within their respective occupation—e.g., information technology workers easily move across industries to manage computer networks (see Kambourov and Manovskii, 2008). Thus, demand shocks to a worker's occupation would have a greater influence over time, while industry-based shocks would have less influence.

To test this possibility, we create an occupational mix growth variable for 1990–2000 and 2000–2007 which is analogous to our industry mix growth measure using 1990 and 2000 U.S. Census occupation share data for counties and national occupation growth rates from the U.S. Department of Labor. The occupation mix variable measures how fast employment in a given county would grow if all of the county's occupations grew at the same rate as the corresponding national average for each occupation. As shown in Panel D of Table 5, when added to the regressions, the occupational mix variable is generally statistically insignificant in the early period but positive and statistically significant in the latter period.

The general pattern for the industry mix variables remains unchanged in the first period, though becoming more negative and significant in the latter period. However, the occupational and industry mix variables are highly correlated in the latter period ($r = .875$), but not in the earlier period ($r = .422$). In addition, when entered in the regression without including industry mix, occupational mix is insignificant for nonmetropolitan and rural counties in both periods, and only significant in the latter period for large metropolitan counties (not shown). While further investigation with micro-data appears warranted, a fundamental shift in the labor market relating to technological changes increasing occupational mobility across industries cannot be eliminated as part of the explanation for the decline in the role of asymmetric industry shocks affecting regional population growth.

5. Conclusion

Using county level data, this paper examined whether the post-2000 downward shift in U.S. gross migration rates signaled that the economy was approaching a stationary spatial equilibrium where established site-specific forces driving population shifts were diminishing in influence. These include the long-standing movements of population to areas possessing a pleasant climate and other desired natural amenity attributes, as well as the traditional movements of population from peripheral to urban core areas. Our findings suggest that these population movements continued post-2000, with amenity-based population shifts becoming only somewhat muted. Thus, current and future differentials in area attractiveness related to natural amenities and urbanization have not been fully capitalized into factor prices to produce a spatial equilibrium in which population growth would be more evenly spread across space. Forces underlying these processes appear to continue producing divergence in well-being across the United States, consistent with the findings of Oswald and Wu (forthcoming).

Nevertheless, we do find a downward shift in population (net migration) responsiveness to spatially asymmetric demand shocks. Pre-2000, net migration was the primary labor supply response to regionally-variant demand shocks. Post-2000, however, demand shocks almost exclusively have been satisfied by changes in local labor supply. This raises the possibility that the tepid job growth associated with strong productivity growth post-2000 provided ample sources of local labor supply, precluding the need for in-migrants to fill new jobs. Yet, using quantile regression analysis, we generally did not find that the marginal population response to a unit labor demand shock in areas with strong growth exceeded the corresponding response in areas experiencing weak growth. This contrasts with an expectation that population would be

[22] We also estimated a *net*-migration model that included the homeownership variable (results not shown). With the exception of the large MA results in the latter period, the homeownership coefficient was positive and statistically significant (it was positive and insignificant in the 2000–2007 large MA case). Thus, a modest up-tick in homeownership rates in the latter period is *positively* associated with population growth differentials supporting our conclusion about the effect of the housing market bubble on net migration (though it is inversely associated with gross migration flows).

[23] The U.S. median ages in 1990, 2000, and 2007 were respectively 32.8, 36.5, and 37.8 (source: U.S. Census Bureau, http://www.census.gov/popest/archives/1990s/nat-agesex.txt and http://www.census.gov/popest/national/asrh/NC-EST2009-sa.html. downloaded August 30, 2010).

more responsive in faster growing areas with tighter labor markets than in those with more excess labor supply if the difference in national employment growth across the two period was responsible for the shift in migration responsiveness.

The lack of migration response to differential economic shocks suggests a structural shift, in which U.S. regional labor markets took on more of a European flavor, potentially affecting macroeconomic performance and adjustments to shocks. For example, only post-2000, did we find greater variability in demand shocks to be associated with lower net migration, suggesting increased risk aversion as reducing migration. If so, government policies would need to be oriented more towards creating jobs where the people are, rather than assuming that people will move to the jobs (Partridge and Rickman, 2006a). Yet, amenity migration, albeit somewhat muted, and core–periphery migration, indicated some continued willingness to move.

Thus, other potential explanations for the changing role of migration in satisfying spatially asymmetric demand shocks should be explored. One possibility is a rise in mobility across industries, as suggested by the findings of Kambourov and Manovskii (2008) for 1968–1997. Among the possible explanations they offered were changes in government regulation, unionization and increased globalization. Greater use of contingent workers also could facilitate such industry mobility. In our case, if workers could more readily shift across industries within their occupation, workers would be more affected by occupation (skill) shocks and less affected by shocks to industry. Indeed, we find some preliminary evidence that geographical mobility is increasingly tied to occupationally-based demand shocks and less so by industry-based shocks, which would reflect a major shift in the functioning of regional labor markets. It is unclear how such a trend would affect regional adjustments to asymmetric economic shocks or the overall flexibility of the U.S. labor market. Future research could use micro-data to further explore the potential nexus between occupational mobility and dwindling U.S. internal migration, and the implications for U.S. regional labor market dynamics and economic performance.

Appendix Table 1
Variable definitions and data sources.

Variable	Description	Source
Population change	Annual percentage change in population over 1990–2000, and 2000–2007	1990 2000 census, 2007 intercensal est.
Employment/pop ratio	Ratio employment to population 18+, 1990, 2000, 2007	1990 2000 census, U.S. BLS
In-, out-, net-migration rates	In-, out- and net-migration from county *i* divided by its population	IRS, U.S. Census Bureau Current Population Survey
Economic		
Industry mix growth	Industry mix employment growth, calculated by multiplying each industry's national employment growth (1990 to 2000, and 2000–07) by the initial period (1990 2000) industry employ share in each sector	1990, 2000 BEA, authors' est.
log (av wage 1990 2000); log (wtd av med rent 1990 2000)	Log difference of 2000 and 1990 average wage per job ($). Log difference of 2000 and 1990 weighted average median gross house rent (dollars per month) of owner and renter occupied housing units.	BEA, REIS census
Geographic		
Dist to nearest/actual urban center (micropolitan or metropolitan area)	Distance (in km) between centroid of a county and population weighted centroid of the nearest urban center, if the county is not in an urban center. It is the distance to the centroid of its own urban center if the county is a member of an urban center (in km).	1990 census, C-RERL
Inc dist to metro	Incremental dist. to the nearest/actual MA in km	Authors' est.
Inc dist to metro > 250 k	Incremental distance to the nearest/actual MA with > 250,000 population, population (1990)-weighted centroids, in km	Authors' est.
Inc dist to metro > 500 k	Incremental distance to the nearest/actual MA with > 500,000 population, population (1990)-weighted centroids, in km	Authors' est.
Inc dist to metro > 1500 k	Incremental distance to the nearest/actual MA with > 1,500,000 population, population (1990)-weighted centroids, in km	Authors' est.
County pop 1990 2000	County population 1990 2000	1990 2000 census
Nearest/Actual Urban Center pop 1990 2000	1990 2000 population of the nearest/actual MICRO or MA center.	Authors' est.
Weather/amenity		
Amenity index	Vector includes: mean January sun hours; mean January temperature (degree F); mean July relative humidity (%);typography score 1 to 24, in which 24 represents the most mountainous; natural amenity rank 1 to 7, with 7 being the highest;% of county area covered by water	ERS, USDA
Proximity to Great Lakes	1 if county centroid is within 50 km of Great Lakes	Authors' est.
Proximity to Pacific Ocean	1 if county centroid is within 50 km of Pacific Ocean	Authors' est.
Proximity to Atlantic Ocean	1 if county centroid is within 50 km of Atlantic Ocean	Authors' est.
Demographic		
% female 1990, 2000	% of 1990 (2000) population that are female	1990 2000 census
% married 1990, 2000	% of 1990 (2000) population that are married	1990 2000 census
% with disabilities 1990, 2000	% of 1990 (2000) 16–64 pop with a work disability	1990 2000 census
Age shares	Percent of 1990 2000 population <6 years; 7–17 years; 18–24 years; 55–59 years; 60–64 years; and > 65 years.	1990 2000 census
Educational attainment	% of 1990 2000 population 25 + that are high school graduates; have some college; have an associate degree; and are 4 yr. college grads.	1990 2000 census
% immigr. 1985–90, 1995–00	Percent of 1990 2000 population immigrated 1985–90, 1995–2000	1990 2000 census
Armed forces emp share	% of county employment 1990 2000 that is in the armed forces	1990 2000 census
Race/ethnic	% of 1990 population Black; Native American; Hispanic; Asian and Pacific Islands; other race.	1990 2000 census

Notes: centroids are population weighted. The metropolitan/micropolitan definitions follow from the 2003 definitions. BEA = Bureau of Economic Analysis, Regional Economic Information Service; U.S. BLS = Bureau of Labor Statistics, State and Local Unemployment Rates, http://www.bls.gov/lau/data.htm; IRS = Internal Revenue Service, U.S. Population Migration Data, http://www.irs.gov/taxstats/article/0,,id=212683,00.html; ERS, USDA = Economic Research Services, U.S. Department of Agriculture; C-RERL = Canada Rural Economy Research Lab, University of Saskatchewan. See Partridge and Rickman (2006a) for more details of the variable sources and sample selection.

Appendix Table 2
Descriptive statistics, mean and (standard deviation) for U.S. counties, selected variables.

	1990–2000 period				2000–2007 period			
	Non-metro	Rural	Sm. MA	Lg. MA	Non-metro	Rural	Sm. MA	Lg. MA
Pop growth 1990–00	0.5950	0.4776	1.2661	1.5442	−0.0919	−0.2795	0.7472	1.0945
and 2000–07	(1.08)	(1.10)	(1.12)	(1.36)	(0.96)	(0.95)	(1.07)	(1.52)
Chg in emp/pop. (18+)	0.0165	0.0173	0.0191	0.0153	−0.0027	−0.0003	−0.0121	−0.0257
ratio 1990–00/2000–07	(0.05)	(0.05)	(0.03)	(0.03)	(0.05)	(0.06)	(0.03)	(0.03)
Ind mix emp gr	0.2075	0.2095	0.2100	0.2149	0.0588	0.0617	0.0564	0.0561
1990–00/2000–07	(0.04)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
Distance to nearest	41.07	59.91	16.85	26.27	41.07	59.91	16.85	26.27
or actual UC	(36.52)	(30.56)	(17.00)	(16.77)	(36.52)	(30.56)	(17.00)	(16.77)
Incremental dist to a metro	55.40	43.47	0.00	2.33	55.40	43.47	0.00	2.33
	(51.67)	(49.93)	(0.00)	(7.37)	(51.67)	(49.93)	(0.00)	(7.37)
Inc. dist to	66.80	76.02	93.23	0.00	66.80	76.02	93.23	0.00
metro > 250,000 pop	(106.20)	(115.19)	(93.26)	(0.00)	(106.20)	(115.19)	(93.26)	(0.00)
Inc. dist to	42.89	45.32	36.89	36.29	42.89	45.32	36.89	36.29
metro > 500,000 pop	(66.07)	(68.95)	(59.07)	(73.34)	(66.07)	(68.95)	(59.07)	(73.34)
Inc. dist to	89.03	83.45	78.54	99.37	89.03	83.45	78.54	99.37
metro > 1,500,000 pop	(111.10)	(106.24)	(115.44)	(139.88)	(111.10)	(106.24)	(115.44)	(139.88)
County pop 1990/2000	22,442	13,770	72,161	270,700	24,441	14,832	82,750	308,194
	(20,585)	(10,401)	(64,892)	(539,956)	(22,808)	(11,427)	(76,200)	(595,249)
Pop of nearest or	65,459	73,970	133,332	1,486,906	72,664	82,460	151,186	1,681,592
actual MA 1990/2000	(93,944)	(113,164)	(49,192)	(2,726,624)	(110,160)	(132,956)	(59,500)	(2,997,111)
% 1990(00) pop.	7.7560	7.1534	8.9211	11.0011	7.8995	7.3009	8.8893	11.2831
African American	(14.74)	(14.77)	(12.25)	(13.98)	(14.89)	(14.87)	(12.24)	(14.18)
% 1990(00) pop.	1.8192	2.0982	0.8659	0.6514	1.9445	2.2666	0.8963	0.6623
Native America	(6.72)	(7.66)	(2.67)	(1.64)	(7.06)	(8.09)	(2.63)	(1.49)
% 1990(00) pop. Hispanic	4.3354	4.2174	3.7863	4.8435	5.9260	5.5656	5.7645	7.0098
	(11.64)	(11.46)	(9.17)	(9.82)	(12.55)	(12.21)	(10.66)	(11.25)
% 1990(00) pop. Asian	0.3159	0.2164	0.7911	1.3257	0.4241	0.3173	1.0180	1.8556
	(0.43)	(0.27)	(1.16)	(2.30)	(0.46)	(0.31)	(1.28)	(2.93)
% 1990(00) pop.	1.7779	1.7162	1.6347	1.9858	2.4443	2.2584	2.5950	2.9430
other origin	(4.84)	(4.85)	(3.95)	(4.06)	(4.88)	(4.71)	(4.98)	(4.72)
% 1990(00)	35.00	35.25	34.26	32.47	35.97	36.40	34.27	31.49
high school grad.	(5.96)	(5.82)	(6.32)	(6.07)	(5.89)	(5.59)	(6.76)	(7.00)
% 1990(00) pop.	15.65	15.28	17.10	18.19	20.04	19.98	20.86	21.22
25+ some college	(4.38)	(4.32)	(4.41)	(4.34)	(4.52)	(4.62)	(3.99)	(3.82)
% 1990(00) pop.	5.15	5.01	5.56	5.79	5.47	5.29	5.97	6.23
25+ assoc. degree	(2.20)	(2.26)	(1.96)	(1.77)	(2.05)	(2.02)	(1.86)	(1.68)
% 1990(00) pop.	11.75	10.98	14.83	17.68	14.32	13.51	18.01	21.90
25+ college degr	(4.73)	(4.12)	(6.98)	(8.27)	(5.64)	(4.99)	(8.04)	(9.64)
% 1990(00) Pop.	51.02	50.95	50.97	51.05	50.37	50.25	50.63	50.80
that is female	(1.63)	(1.65)	(1.52)	(1.60)	(2.07)	(2.18)	(1.55)	(1.45)
% 1990(00) pop. married	59.92	60.79	58.03	57.36	58.14	58.83	56.95	56.83
	(5.91)	(5.77)	(5.91)	(6.89)	(5.15)	(5.05)	(5.29)	(6.09)
% 1990(00) pop.	10.05	10.29	9.11	8.28	12.25	12.39	11.50	11.33
with a disability	(3.05)	(3.28)	(2.30)	(2.20)	(3.33)	(3.43)	(3.01)	(2.75)
N	1972	1300	416	641	1972	1300	416	641

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